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INSTITUTE OF GAS TECHNOLOGY

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GAS ABSTRACTS

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CONTENTS

1. Gas Industry 189

2. Appliances, Domestic 189

3. Combustion: Commercial and Industrial Furnaces 190

4. Gasification: Carbonization: Natural Gas Substitutes 192

5. Natural Gas and Natural Gas Condensates 196
   A. Production and Processing:
   B. Compression and Transmission:
   C. Distribution

6. Petroleum and Synthetic Liquid Fuels 201

7. Analytical Methods and Tests 202

8. General and Physical Chemistry 204

9. Organic Chemistry: Petrochemicals 205

10. Chemical Engineering 205

11. Process Equipment and Instrumentation 207

12. Materials of Construction: Corrosion 207

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1. GAS INDUSTRY

Applied Atomic Energy

Murphree, E. V. THE ATOM IN PEACE. *World Petroleum*, 26, 69-73 (1955) September.

The author surveys the present status of atomic development for civilian applications and draws the following conclusion: 1) Uranium can multiply the world's energy resources 23 times; 2) electricity from atomic energy is more costly than from other fuels at present; 3) by 1975 perhaps 1.5 percent of U. S. energy requirements may be supplied by the atom; 4) atomic power for transportation will have limited application except in the marine field; 5) atomic radiation as a promoter of chemical reactions is a promising field for research; 6) in the fields of medicine and industrial and agricultural research, the atom has made great progress. J. M. Reid

FPC Regulation

Springborn, H. W. HARRIS-FULBRIGHT BILL UP NEXT YEAR. *Gas Age*, 116, 29-31 (1955) August 25.

A summary of the status of the Harris-Fulbright bill including a tabulation of the House vote on three proposals, to authorize consideration of the Harris Bill, to recommend it, and to pass it. R. F. Bukacek

Gas Supply

Boyer, E. G. PRACTICE AND PROBLEMS IN THE USE OF NATURAL GAS, REFINERY OIL GAS AND LIQUIFIED PETROLEUM GAS IN GAS PRODUCTION. International Gas Union Paper IGU/4-55 New York Conference (1955) September 26-30.

A review on the present state of the art of supplying peak load gases, peak load gas substitutability for natural gas, gas conditioning and natural gas storage in the United States and a summary of European gas practice. H. R. Linden

Oil Gas vs. Natural Gas

Harrison, A. D. IS OIL GAS COMPETITIVE WITH NATURAL? *Gas*, 31, 44-46 (1955) August.

An analysis of the economics of supplying 25% load factor domestic gas in Brooklyn by production of high-Btu oil gas from residual oils, based on current costs of natural gas from Transcontinental Gas Pipeline Corporation, Tennessee Gas Transmission Corporation and from the Oakford Storage Pool as influenced by interruptible gas rates in the New York area. H. R. Linden

World Gas Industry

Association Royale Des Gaziers Belges, INTERNATIONAL STATISTICS OF THE GAS INDUSTRY. International Gas Union Paper IGU/1-55 New York Conference (1955) September 26-30.

At the request of the International Gas Union, the Belgian group has prepared what is probably the first international statistical review of the gas industry. Tabulated and graphical data are given on 18 countries,—Australia-New Zealand, Austria, Belgium, Canada, Denmark, France, Finland, Germany, Great Britain, Italy, Japan, Netherlands, Norway, Sarre, Sweden, Switzerland, and United States. Data on inhabitants, customers, undertakings, length of mains, meters, materials used, byproducts, gas available, gas sold, gas transported and distributed are given for the years 1937 to 1953. The data is further explained by curves or block diagrams in 10 charts. O. P. Brysch

2. APPLIANCES

Air Conditioning

Cole, V. GAS AIR CONDITIONING SYMPOSIUM. *Gas Age*, 116, 32-37 (1955) July 14.

The Carrier absorption machine is described by Mr. V. Cole, Servel's equipment by W. J. Hoeing, and the Ready-Power engine system by R. C. Marsh. R. T. Ellington

Everetts, J., Jr. WEATHER DESIGN FACTORS IN AIR CONDITIONING. *Mech. Eng.*, 77, 670-72 (1955) August.

The author reviews the variation in air temperature, radiation, human, equipment and air wet-bulb conditioning loads throughout the country and brings out the importance of considering all of these in determining the design load for a given situation. R. T. Ellington

Burner Controls

TEST NEW TOP BURNER CONTROLS. Amer. Gas Assoc. Monthly, 37, 37-38 (1955) September; *Gas Age* 116, 20, 21 (1955) August 25.

A series of tests performed at a demonstration of the new top burner thermostatic control are described along with results obtained in cooking various items of food under controlled temperatures. R. T. Ellington

Refrigeration

Ashby, C. T. and Miller, C. A. (assigned to Servel, Inc.) ABSORPTION REFRIGERATION. U. S. 2,715,818 (1955) August 23.

Use is made of refrigerant liquid traps to prevent recirculation of refrigerant vapor through the inert gas reservoir of the Platen-Munters cycle during periods of high ambient temperature. R. T. Ellington

Betts, G. G. STEAM JET REFRIGERATION. *Institute Chem. Eng. Trans.*, (British), No. 1, 33, 27-44 (1955)

By utilizing the low-pressure steam for winter heating, steam jet refrigeration proves to be very economical for air conditioning in the summer. For process cooling, absorption, or other cases in which severe cooling is not required, this method of refrigeration also has great possibilities. Simplicity of construction renders both the initial and maintenance costs of this type of units very low as compared with other refrigeration systems. Paper gives a thorough analysis of the theory of ejector operation as well as of the actual performance of such units based on data in the literature. S. Hu

Water Heating

Gourley, R. L. WATER HEATERS FOR RENT. *Gas Heat*, 6, 27, 90 (1955) September.

The author presents some of the favorable aspects of water heater rental in both equipment sales and load building. R. T. Ellington

Serif, M. NO WHERE BUT UP FOR WATER HEATER BOOM. *LP-Gas*, 15, 39-41, 120 (1955) August.

The potential of future sales in various parts of the country is outlined. The disadvantages of electric water heaters and the advantages of gas water heaters are discussed from the point of view of sales promotion. Tables and charts are given for sales potential and proper determination of water-heater size. J. R. Hasenberg

3. COMBUSTION AND INDUSTRIAL FURACES

CO Boilers

Campbell, O. F. HERE'S MORE LIGHT ON (1) CO BOILERS AND (2) WASTE-GAS ELIMINATORS. *Oil Gas J.*, 54, 109-11 (1955) August 29.

This new-type CO boiler which is of cylindrical design occupies less space and is appreciably cheaper, with interesting features. The external CO gas-bearing ducts have been eliminated and a water seal is not required between the primary and secondary furnace. The waste gas eliminator illustrated is designed to dispose of any combination of malodorous gases by passing them through a direct-fired furnace with the temperature maintained automatically by the use of auxiliary fuel. S. Volchko

Excess Air Chart

Cumming, A. P. NOMOGRAM FOR DETERMINATION OF EXCESS AIR IN COMBUSTION. *J. Inst. Fuel* (British) 28, 342-344 (1955) July.

A nomogram has been plotted for the excess air equation for the combustion of fuel gases containing little N_2 or CO_2. R. E. Ellington

Flame Research

Kurz, P. F. FLAME STABILITY STUDIES WITH HYDROCARBON MIXTURES. *Fuel* (British), 34, 269-82 (1955) July.

Blow-off limits were determined for mixtures of hydrocarbons as fuels. Both saturated and unsaturated hydrocarbons were used. All the results can be described by the empirical equation: (Summation, 1 to n) $C_i/C^* = 1$ for an n-component fuel, where C_i is the volume fraction of the component "i" in the mixture that has a blow off limit at a given jet velocity, and C_i^* is the volume fraction in its binary mixture with air, that has a blow-off limit at the same

jet velocity. When acetylene is a component, $C^*C_2H_2$ does not correspond to that determined in the acetylene-air system. But a value may be assigned to $C^*C_2H_4$ that is valid in all multicomponent hydrocarbon systems. S. A. Weil

Flue Gas Corrosion

Kear, R. W. LOW-TEMPERATURE CORROSION BY FLUE-GAS CONDENSATES. *Brit. Coal Utilis. Research Assoc. Monthly Bull.*, 19, 297-318 (1955) July.

The presence of sulfurous and sulfuric acids formed by combination of water vapor and sulfur oxides is the chief cause of flue-gas corrosion. Corrosion becomes serious in presence of a condensed liquid phase, and such condensation is aggravated by sulfuric acid, in that it occurs at temperatures far above the normal dew-point temperature of water. Modern investigations which have led to these conclusions are reviewed with regard to corrosion mechanism, corrosion measurement, role and reactions of sulfur, industrial studies, appliance and chimney corrosion, effects of chlorine and nitrogen, and corrosion prevention. Additions of dusts and smokes to the furnace atmosphere have given some reduction in corrosion.

O. P. Brysch

Hydrocarbon Combustion Rates

Longwell, J. P. and Weiss, M. A. HIGH TEMPERATURE REACTION RATES IN HYDROCARBON COMBUSTION. *Ind. Eng. Chem.*, 47, 1634-43 (1955) August.

A reactor was designed that permits rapid mixing of fuel and air, and a small residence time of the burning mixture. The purpose is to attain a steady state such that, within the reactor, the temperature is uniform, the reaction homogeneous and transfer process negligible. Under these conditions the rate is determined by the chemical kinetics only. As the residence time is decreased by increasing the flow rates, at some flow rate the flame is blown out because the reaction rate cannot maintain the combustion process. Blowout data were used as measures of the reaction rate. With iso-octane as fuel, the authors express their results in the fuel-lean region on the basis of the limiting step being the reaction of O_2 and CO resulting from the initial reaction steps. For fuel-rich mixtures the determining concentrations are assumed to be the iso-octane and O_2. The best fit indicates a 1.8-order reaction. S. A. Weil

Industrial Heating

Smith, A. Q. LIGHTWEIGHT AGGREGATE MAJOR AID TO BUILDERS. *Ind. Gas*, 34, 3-4 (1955) July 5.

A description is given of the process of sintering clay to form the aggregate for light-weight concrete and concrete block. R. T. Ellington

Methane Kinetics

Levy, A. KINETICS OF THE HYDROGEN-OXYGEN-METHANE SYSTEM. I. INHIBITION OF THE SECOND EXPLOSION LIMIT. *J. Phys. Chem.*, 59, 721-727 (1955) August.

The addition of small amounts of methane results in a lowering of the second explosion limit of the hydrogen-oxygen system. The decrease is linear with the methane fraction and is attributed to a chain breaking reaction between methane and the radicals H, O, and OH. The linearity ends abruptly at some critical value of methane concentration, and the second limit becomes zero. It is proposed that above the critical methane concentration, enough formaldehyde is formed to completely inhibit the reaction. In fuel-rich mixtures, the critical methane concentration is linear with the initial oxygen concentration and has a constant apparent energy of actuation. In fuel-lean mixtures, no such correlation can be made.

S. A. Weil

Levy, A. and Foster, J. F. KINETICS OF THE HYDROGEN - OXYGEN - METHANE SYSTEM. II. THE SLOW REACTION. *J. Phys. Chem.*, 59, 727-33 (1955) August.

The results of studies of effect of methane on the reaction kinetics of the hydrogen-oxygen system at 560° C. are presented. Very tentative conclusions concerning the mechanism are offered. S. A. Weil

Nitric Oxidants in Flames

Miller, R. O. FLAME PROPAGATION LIMITS OF PROPANE AND *n*-PENTANE IN OXIDES OF NITROGEN. Nat. Adv. Comm. Aeron. Techn. Note 3520 (1955) August.

Flammability limits of C_3H_8 and C_5H_{12} were

determined with NO, N_2O_4 and their mixtures as oxidants. The use of N_2O_4 narrows the flammability range near atmospheric pressure but lowers the lower pressure limit. From the estimated flame temperatures at the limits, the author concludes that the NO reacts through dissociation to form oxygen. S. A. Weil

Ore Reduction

Buehl, R. C. and Royer, M. B. SMELTING IRON ORE WITH ANTHRACITE; BUREAU OF MINES EXPERIMENTAL BLAST FURNACE. U. S. Bur. Mines Rept. Inv. 5165 (1955) August.

Anthracite in various amounts was used to replace coke in a 3-feet diam. experimental blast furnace. Anthracite up to 40% of the total fuel gave good operation, with normal sulfur and silicon in the metal. Poor operation and "hung" shaft occurred with an increase to 50 percent anthracite. O. P. Brysch

Resonant Combustion

Tenney, W. L. and Marks, C. B. RESONANT INTERMITTENT COMBUSTION HEATER AND SYSTEM. U. S. 2,715,390 (1955) August 16.

Reduction of thrust and efficient utilization of heat in the exhaust gases from the resonant intermittent combustion cycle characteristic of pulse jet engines by use of exhaust tubes with length to diameter ratios in excess of 35 to 1. R. T. Ellington

Tailored Heating

LeMay, R. C. FLAME GEOMETRY AIDS HEAT PROCESSING. *Gas Age*, 116, 38-42 (1955) August 11: Amer. Soc. Mech. Eng. Paper 55-SA-10.

The author reviews the advisability of tailoring heat application to the part being processed to meet modern process requirements and fit in with the growth of automation in industry. R. T. Ellington

Turbine-Drive Generator

PORTABLE MAINS POWER GENERATOR USES GAS-TURBINE. *Petroleum*, (British) 18, 309-10 (1955) August.

The industrial, 60-hp. 120-lb, version of the Rover turbine is described and operating curves presented. R. T. Ellington

Turbulent Flames

Summerfield, M., Reiter, S. H., Kebely, V. and Mascolo, R. W. THE STRUCTURE AND PROPAGATION MECHANISM OF TURBULENT FLAMES IN HIGH SPEED FLOW. *Jet Propulsion*, 25, 377-84 (1955) August.

In methane-air turbulent flames, radiation due to H_2O molecules occurs 2-10 mm after that due to CH molecules. Temperature measurements indicate that the maximum CH radiation occurs before the maximum temperature. These observations are inconsistent with the concept that the turbulent brush flame is a highly wrinkled laminar flame. The authors propose that, like a laminar flame, the turbulent flame consists of zones and that the equations describing laminar flames can be used for turbulent flames if the transport coefficients are replaced by the turbulent analogues. S. A. Weil

4. GASIFICATION AND CARBONIZATION

Carbonization

Jenkins, G. I. CHEMICAL ENGINEERING DEVELOPMENT IN THE COAL INDUSTRY. *Chem. and Ind.* (British), No. 35, 1068-76 (1955) August 27.

The research activities of the National Coal Board Laboratories at Stoke Orchard, Gloucestershire, U. K. are described in detail. An integrated unit operating at a throughput of about 60 lb/hr, for the production of solid smokeless fuel is described. Finely divided coal is fed to an oxidation chamber and the oxidized coal is transported by means of preheated air to a briquetting unit where the oxidized coal is mixed with hot flux to obtain briquettes with strength of 60 lb. These, in turn, are fed by gravity directly into a high-temperature carbonization retort working on the sand-circulation system. It is claimed that this process results in higher thermal efficiencies without the necessity for heat recovery units between stages of the process. K. C. Channabasappa

Coal Gasification

Palmer, G. H., and Alexander, C. (assigned to The M. W. Kellogg Co.) HEAT TREATMENT

OF SOLID CARBON-CONTAINING MATERIALS. U. S. 2,713,590 (1955) July 19.

The invention describes a low-temperature process for the production of a synthesis gas containing hydrogen and carbon monoxide using pulverized coal and two reactors. Fluidized coal and oxygen react in one of the vessels at a temperature between 1800 and 2000° F. Unreacted coal from this reactor is circulated to the second reactor where it is contacted with steam at temperatures between 1300 and 1700° F. E. J. Pyrcioch

Pettyjohn, E. S., and von Fredersdorff, C. G. (assigned to The Institute of Gas Technology, Chicago) METHOD FOR GASIFYING COAL. U. S. 2,715,573 (1955) August 16.

The patent covers a method of continuously pulverizing and gasifying carbonaceous solids in an apparatus comprising a flow nozzle or orifice discharging a powdered coal suspension into a vortex chamber which in turn discharges the final pulverized material into a slagging gasification chamber at atmospheric or superatmospheric pressures. Producer gas or water gas can be generated, depending on the oxygen concentration of the suspending gas.

C. G. von Fredersdorff

Venter, M. J. and Ledent, M. P. LA GAZEIFICATION INTEGRALE DU POUSSIER DE CHARBON: PERSPECTIVES D'AVENIR. (COMPLETE GASIFICATION OF COAL DUST: FUTURE PROSPECTS.) *Rev. gen. Gaz* (Belg.), 77, 124-33 (1955) July-August.

The authors review the present status of complete gasification processes, with reference to the optimum utilization of Belgian coals. The processes discussed and illustrated are mostly in experimental installations; the Wirbelkammer W. K. III of Ruhrgas A. G. at Recklinghausen; Panindco of Cie. Generale de Construction de Fours, and Cherchar, at Rouen; Koppers-Totzek at Oulu, Finland and at Mazengarbe, Pas-de-Calais; U. S. Bur. Mines-Babcock & Wilcox Co. at Morgantown; E. I. du Pont at Belle, W. Va., and Institute of Gas Technology at Chicago. Principles and performance of these processes using air or oxygen, with and without pressure are outlined, with regard to application in the proposed experimental plant of Inichar. O. P. Brysch

Coal Reflectivity

McCartney, J. T. and Hofer, L. J. MICROREFLECTIVITY ANALYSIS OF COAL. *Anal. Chem.*, 27, 1320-25 (1955) August.

Quantitative measurements of the reflectivities of coal components have been made on polished solid blocks and on briquets of granular samples, using a specimen scanning device, a reflected-light microscope, with high resolution of areas of different reflectivity, a photomultiplier photometer, and a recording microammeter. It is claimed that this method provides a more objective petrographic analysis of coal than the conventional Bureau of Mines time-section technique and offers a simple, inexpensive means of determining the relative merits of different coals that are economically available for the production of gasoline and coal chemicals by hydrogenation.

K. C. Channabasappa

Coke-Oven Heat Flow

Millard, D. J. A STUDY OF TEMPERATURE CONDITIONS IN A COKE OVEN. *J. Inst. Fuel* (British), 28, 345-51 (1955) July.

The heat-flow equation, based on thermal conduction, is applied to a study of temperature conditions in a coke oven. First, laboratory studies were made on thermal conductivity and volume specific heat for several coals. These were used to calculate temperature-history curves for different points in a coke oven, without considering other heat producing or absorbing factors. These curves were compared to those actually measured in the oven, and a marked discrepancy was noted. This indicated that heats of reaction were important. Detailed study of a small region of an experimental oven charge was made using measured temperature-history curves as boundary conditions of the region and solving by electric analog for intervening steps by adding or substracting a postulated heat of reaction quantity, until the solved heat flow result fitted the curves. Correcting by the amount of reaction heat (endothermic below 700° (and exothermic above), the heat flow equations, when re-solved for the whole oven, gave calculated values which agreed well with the observed temperatures. Tabulated and graphical data of above tests are presented.

O. P. Brysch

COS Removal

Rieve, R. W. (assigned to The Atlantic Refining Co.) REMOVAL OF CARBONYL SULFIDE FROM HYDROCARBON GASES. U. S. 2,713,077 (1955) July 12.

According to this invention carbonyl sulfide can be removed from hydrocarbon gases by hydrolysis on an anion exchange resin. Hydrocarbon effluent from a bed of resin is almost completely free not only of carbonyl sulfide but also of its hydrolysis products, H_2S and CO_2. When the bed has reached its capacity the resin may be regenerated by treatment with sodium hydroxide solution. Particularly suitable resins are those produced by reaction of tertiary amines with haloalkylated vinyl aromatic hydrocarbon copolymers (Amberlite IRA-400 type). D. M. Mason

Gasification with Oxygen

Dent, F. J. THE USE OF OXYGEN IN GASIFICATION. *Chem. Eng. Sci.*, Spec. Suppl. Oxidation Processes 3, 126-33 (1954) May 6-8.

The effect of the use of oxygen on the economy and efficiency of certain gasification processes is examined and discussed. Included in this study are: the cyclic water gas process; the Winkler process; suspension gasification processes; and the Lurgi process. The author concludes that increases in efficiency and output do not alone justify the cost of oxygen, but that its use allows gasification of unreactive coals and operation at elevated pressures.

E. J. Pyrcioch

German Energy Resources

Gumz, W. THE FUEL AND POWER RESOURCES OF GERMANY AND THEIR UTILIZATION. *J. Inst. Fuel* (British), 28, 393-415 (1955) August.

Over 95 percent of Western Germany's energy supply is based on indigenous coal. Coals, mining areas, and production are discussed briefly, as well as petroleum and peat. The energy demand is reviewed as of 1953, especially with regard to electricity, gas, iron and domestic coal production. Developments in boiler furnaces, gasification and domestic boilers are outlined. Discussion and 33 references are included. O. P. Brysch

Methane Drainage

Cawley, R. L. and Jones, J. H. METHANE DRAINAGE: AN ACCOUNT OF THE WORK CARRIED OUT AT HAIG PIT, WHITEHAVEN. *J. Inst. Fuel* (British), 28, 366-82 (1955) August.

Dangerous gassy seams of the Haig mine, Whitehaven, in the Cumberland coal field, N. England, have been made safe, coal production has been increased by 50%, and utility gas and gas boiler fuel equivalent to 14000 tons coal/year is recovered by an extensive bore-hole and pipeline drainage system. Boreholes of 2½-inch diam. are drilled 20 to 30 yd apart along the side of an advancing longwall panel at an angle of 60° into the overlying strata (the workings are 3 miles at sea from the coast). The cement-sealed borehole pipe is connected to 9- and 6-in branches leading to a 14-in main, under a suction at the surface of 14 in w.g. Detailed description is given on the mine problems, drainage operation, and utilization schemes. O. P. Brysch

Oil Gasification

Stookey, K. W., Steinwedell, W. E., and Kyle, R. T. (assigned to The Gas Machinery Co.) METHOD AND APPARATUS FOR MAKING OIL GAS. U. S. 2,714,058 (1955) July 26.

According to the present invention, new and improved processes and apparatus therefor are provided, by which a far greater efficiency is obtained and by which the temperature throughout the set can be easily and closely controlled. In its broadest aspect the process involves the use of two shells which communicate with each other at the top through a crossover passage or tunnel. The set comprises a first superheater zone, a first generator zone superimposed thereon, a crossover zone, a second generator zone and a second superheater zone disposed below said second generator zone. A substantial portion of each superheater zone also serves as a regenerative zone during at least a part of the process cycle. The superheater zones communicate with one or more stacks for venting flue gas or with one or more wash-boxes for washing, cooling, and sealing the oil gas produced. One of the principal innovations of the present invention is the introduction of the heat oil at one or more points in

the set which enables a substantial amount of heat to be stored in the crossover zone as well as in the generator zones and superheater zones, which heat is later used for making oil gas. Due to applicant's invention less heat is lost when the flue gases are vented and more heat is stored in the set for use in making oil gas. Selected Extracts

Oxide Purification

Grocott, F. OXIDE PURIFICATION IN THE MIDLANDS. *Gas J.* (British), 283, 385-88 (1955) August 10.

The behavior of the different oxides in purifiers of conventional box design at Saltley Gasworks over a period of five years is described.
D. M. Mason

Sulfur Recovery

RECOVERY OF SULFUR FROM OIL IN CANADA. *Gas J.* (British), 283, 507-08, 510 (1955) August 24.

Shell Oil Co. of Canada Ltd. has two sulfur recovery plants in operation at Jumping Pound Field, Alberta. This illustrated article briefly describes both plants and the processes employed. Editor's Abstract

Synthesis Gas

Batchelder, H. R. and Hirst, L. L. COAL GASIFICATION AT LOUISIANA, MISSOURI. *Ind. Eng. Chem.*, 47, 1522-28 (1955) August.

The Bureau of Mines Synthetic Fuels Demonstration Plant gasification unit with its later modifications is described and the results obtained are discussed. Bottom firing was employed in the vertical gasifier with two different burner arrangements, a single tangential burner system and a two-opposed burners system. Less severe refractory loss and erosion was encountered with the two opposed burners system. Ash was removed as liquid slag from the bottom of the gasifier. Coal was fed by a screw feeder and conveyed with oxygen and in later tests with steam. Improved results were obtained in the steam-conveyed coal tests. Rock Springs, Wyoming and Illinois No. 6 bituminous coals were used in the tests with carbon conversion up to 100 percent at high oxygen-coal ratios. E. J. Pyrcioch

Linder, W. (assigned to Koppers Co., Inc.) METHOD AND APPARATUS FOR THE PRODUCTION OF COMBUSTIBLE GASES FROM LIQUID FUELS. U.S. 2,716,597 (1955) August 30.

The invention consists of the production of combustible gases from liquid fuels in such a way that only a portion of the liquid fuel to be gasified is caused to react directly with oxygen in order to produce continuously gases, preferably combustible gases of high temperature and after that introducing before cooling into the flow of hot gases the other portion of the fuel, preferably in a continuous stream. This principle of operation according to the invention may be reduced to practice in different ways. One way consists in introducing into the reaction chamber the liquid fuel in finely divided, but liquid, form viz. one portion in mixture with gaseous oxygen and the other portion without addition of oxygen at a place or places which are more or less spaced from the inlet of the fuel-oxygen mixture.
Selected Extracts

Moses, D. V. (assigned to E. I. du Pont de Nemours and Co.) PREPARATION OF CARBON MONOXIDE AND HYDROGEN BY PARTIAL OXIDATION OF CARBONACEOUS SOLIDS. U. S. 2,716,598 (1955) August 30.

A process is described for the production of synthesis gas by the partial combustion of pulverized coal with oxygen and steam in a generator incorporating an improved method for discharging molten slag through a liquid seal.
E. J. Pyrcioch

Sage, B. H. (assigned to Texaco Development Corp.) METHOD AND APPARATUS FOR PARTIAL COMBUSTION OF GASIFORM HYDROCARBONS. U. S. 2,713,894 (1955) July 26.

The invention describes a burner for the production of carbon monoxide and hydrogen by the partial combustion of gaseous hydrocarbons in which alternate streams of reactants are injected adjacent to one another as relatively thin parallel sheets. E. J. Pyrcioch

Water Gas

Pearce, T. J. (assigned to Imperial Chemical Industries Ltd.) PRODUCTION OF WATER GAS AND THE LIKE. U. S. 2,716,055 (155) August 23.

By increasing the "blow" air in a fluidized-bed water gas process to a rate at least twice that required to produce an entrained stream, the carbon monoxide losses are reduced and combustion temperatures increased, whereby the more highly heated particulate carbon can be introduced into a separate "boiling-bed" make-zone for improved water gas yields.

O. P. Brysch

5. NATURAL GAS AND NATURAL GAS CONDENSATES

Compressors

Menard, H. and Blossom, E. D. ADVANTAGES OF LATENT COOLING OF COMPRESSORS. *Petroleum Eng.*, 27, C12-18 (1955) August 27.

The three general types of water cooling systems for the water jackets of internal combustion engines are discussed. The conventional and hot-water cooling systems (cooling fluid below the boiling point) are compared with the latent cooling system (boiling actually occuring in the engine jacket). The authors' operating experience and conclusions are included on the conventional and latent systems.

R. S. Walters

Taylor, R. M. NEWLY DEVELOPED POROUS CHROMIUM PLATING INCREASES LIFE OF POWER CYLINDER LINER. *Gas*, 31, 118-20 (1955) August.

A discussion of the merits of Porus-Krome power-cylinder liners; an electrically plated and specially treated chromium liner with very good properties is claimed. R. F. Bukacek

Cramer, F. R. WATER INJECTION CURBS ENGINE DETONATION. *Oil Gas J.*, 54, 92-4 (1955) August 1.

A report on tests by Southern Counties Gas Co. on a 1650 hp pipeline compressor which show that water injected into the scavenging air in the form of fine droplets prevents detonation while increasing overall engine efficiency.

R. F. Bukacek

Dehydration

GAS DEHYDRATION TODAY: Gravis, C. K. GAS DEHYDRATION, AN IMPORTANT FUNCTION OF LOW-TEMPERATURE SEPARATION. Mize, W. W. OPERATOR'S COMMENTS. Francis, A. W. MANUFACTURER'S COMMENTS. *Petroleum Eng.*, 27, E2-8 (1955) August.

The first of these complementary articles describes the various low-temperature separation processes and the dehydration obtained. The second presents the bases upon which one company chooses between glycol, glycol-MEA, and dry desiccant units. The manufacturer's discussion covers such factors as pressure loss, desiccant capacity, direction of regeneration and load factor for solid desiccant units and other factors for liquid units.

R. T. Ellington

Dew Points

Polderman, L. D. EQUILIBRIUM DEW POINTS IN NATURAL GAS-GLYCOL SYSTEMS. *Oil Gas J.*, 54, 198-99 (1955) July 25.

Charts of frost points, dew points, dew point depressions and boiling points are presented for aqueous solutions of both diethylene and triethylene glycols. R. F. Bukacek

Distribution

Moore, R. I. SELECTION OF AN OPTIMUM OPERATING PRESSURE FOR A MEDIUM PRESSURE DISTRIBUTION SYSTEM. *Gas*, 31, 37-41 (1955) August.

The desirable operating characteristics of a medium-pressure distribution system that affect its optimum operating pressure are considered. Empirical factors are defined that can be applied to the design load to allow for increased capacity and extreme peak loads and these factors are used in the derivation of equations for the calculation of optimum operating pressures. The results obtained by use of these equations are summarized in a series of parametric curves, showing the relationship between the variables involved in the selection of pressure. G. G. Wilson

Peachey, G. H., Jr. STOPPING A 24-IN. MAIN. *Gas Age*, 115, 45, 46 (1955) June 16.

A description of the use of a special concrete mixture to plug a 24-in intermediate-pressure

cast-iron gas main. Two canvas-covered rubber bags were used to hold the cement in place until it had solidified. G. G. Wilson

Drilling

Brantly, M. M. and Smith, F. W. AIR DRILLING IS DEVELOPING RAPIDLY. *World Oil* 140, 189-92 (1955) June.

The use of air as a circulating medium has received considerable attention in the search for faster and more economical drilling methods. Many problems are still to be solved, but recent progress promises that additional experience and experiments may solve them and result in still further improvement in operation. This is a summary of results to date. B. E. Eakin

Huebotter, E. E., Dunn, T. H., Bell, F. S. HOW TO SELECT AND USE ROTARY DRILLING FLUIDS. *World Oil*, 140, 207-08, 212, 214 (1955) June.

This article, the final part of a discussion of the factors affecting maintenance of rotary drilling fluids, includes a presentation of the type of drilling fluids, their properties, practices associated with the various types, and the effect of drilling practice on mud behavior. Four conclusions were reached by this committee covering 1) factors affecting compounding, 2) drilling fluids cost as affected by drilling practices, 3) the factors to consider for establishing the bed maintenance program, and 4) cooperation between the personnel of the rig and the service company. B. E. Eakin

Link, T. A. and Downing, J. A. ALBERTA AND BRITISH COLUMBIA. *World Petroleum*, 26, 55-63 (1955) May.

A review is presented of the drilling activities, production, and reserves for Alberta in 1954. Oil discoveries for 1954 in Alberta and British Columbia are also reviewed, and the geology of these new fields discussed briefly. A large map showing oil and gas fields and pipelines, and a large scale general cross section for Alberta, are included. B. E. Eakin

Magner, H. G. PROGRESS OF AIR, GAS DRILLING IN THE APPALACHIAN AREA. *Drilling*, 16, 71-72, 176-77 (1955) June.

The introduction of air or gas as the drilling fluid for rotary rig operation has made this drilling method economically competitive with cable-tool drilling in the Appalachian Area. A brief review of developments to date and future prospects is presented. B. E. Eakin

Poettmann, F. H. and Bergman, W. E. DENSITY OF DRILLING MUDS REDUCED BY AIR INJECTION. *World Oil* 141, 97-100 (1955) August 1.

Charts for estimating air volumes required to obtain a desired density reduction are presented, together with derivation of the necessary equations, and examples of calculations and use of charts. B. E. Eakin

Schultz, W. E. MUD PRACTICES VARY GREATLY IN SOUTHEASTERN NEW MEXICO. *World Oil*, 140, 194, 197-98, 200 (1955) June.

A summary of the problems encountered in New Mexico and the mud programs utilized to combat them, is given. Considerable technical information is included. B. E. Eakin

Dust Removal

Hawksley, P. G. PARIS CONFERENCE ON GAS CLEANING, JUNE, 1954. *Brit. Coal Utilis. Res. Assoc. Monthly Bull.*, 19, 197-204 (1955) May.

Held by the Institut Francais des Combustibles et de l'Energie (I.F.C.E.), the Paris conference included the presentation of thirteen papers dealing with such topics as atmospheric pollution, properties of aerosol particles, filters, cyclones, electrostatic precipitation, ultrasonic agglomeration and the problems of selecting and testing gas-cleaning plants. The papers briefly reviewed cover both theory and practice. A lack of experimental data on the performance of industrial gas-cleaning was noted. E. J. Pyrcioch

Exploration

Hunter, C. D. DEVELOPMENT OF NATURAL GAS FIELDS OF EASTERN KEN-

TUCKY. *Petroleum Eng.*, 27, B47, 49-50, 52 (1955) May.

A brief summary of 21 of the gas fields of Eastern Kentucky is presented. The exploration developments during 1954 are also reviewed. B. E. Eakin

Linn, E. H. FUTURE POSSIBILITIES IN THE APPALACHIAN BASIN. *Petroleum Eng.*, 27, B32-36 (1955) May.

This area has been plagued from the start by drilling and geologic difficulties. Many of the relatively shallow formations have not even been explored intensively, and the deeper formations are just beginning to be drilled. Recent developments in the region and their future prospects are discussed.

B. E. Eakin

Merrit, J. W. HOW TO AVOID COSTLY ERRORS IN GAMMA RAY SURVEYING. *World Oil*, 141, 84, 87-88, 90 (1955) August 1.

The successful use of radiation equipment in the search for oil is dependent on the use of suitable instruments, proper surveying methods, and accurate interpretation. The requirements of instrumentation and sampling technique are outlined, and the dangers and sources of contamination and false readings due to natural causes are discussed. The need for professional interpretation of the raw data in order to obtain useful information is emphasized. B. E. Eakin

NEW LOGGING TECHNIQUE SPEEDS SEISMIC SURVEYS. *World Oil*, 141, 101 (1955) July.

The acoustical or continuous velocity logger greatly improves the formation correlation and in some instances permits analytical evaluation of the formation penetrated. A schematic diagram and description of the equipment is given, and a sample continuous velocity log is compared with a seismic record. B. E. Eakin

ON THE CONTINENTAL SHELF: A WHOLE NEW BUSINESS IS IN THE MAKING. PART I. *Petroleum Week*, 1, 14-18 (1955) July 29.

The off-shore drilling boom is in the embryo stage, but already the problems encountered are manifold. Some of these problems are reviewed and a few of the reasons why operators are in such a hurry to obtain off-shore production are discussed. Since 1947 the industry has spent about $700-million offshore, and have obtained a return of only $125-million. However, the economics of the picture is improving, and new improved techniques should result in a decided increase in offshore activity in the future.

B. E. Eakin

Field Corrosion

Barrett, J. P. and Gould, E. D. CATHODIC PROTECTION FOR OIL-WELL CASING. *Oil Gas J.*, 54, 90-91 (1955) July 18.

Techniques used in the cathodic protection of oil well casings are briefly described and typical results are shown by means of potential profile plots before and after protection. Consideration is also given to the nature of the surface pipe effect. G. W. Wilson

Koger, W. C. HOW TO REDUCE CORROSION IN PRODUCTION OPERATIONS. *World Oil*, 141, 182, 184, 186, 190, 192, 195, 198 (1955) July.

Methods used and results obtained by Cities Service Oil Company in combatting corrosion in production operations in Kansas are described including cathodic protection of well casings and treating equipment and inhibitor injection in sour crude wells.

G. G. Wilson

Nation, J. H. and Westbrook, S. S. FORMATION FLUIDS CORRODING YOUR CASING? *Oil Gas J.*, 54, 96-98 (1955) July 18.

Experience with pozzolan cement compositions in western Kansas has indicated better perforating properties, lighter weight slurries, better pumpability, lower cost, and improved resistance to corrosive formation fluids than is obtained with other types of cement compositions. G. G. Wilson

Fracturing Treatment

Menneer, J. HYDRAFRAC SUCCESS. *Petroleum Eng.*, 27, B81-82, 87-89 (1955) May.

Hydrafrac processes are achieving notable success in the Province of Saskatchewan where pay zones are frequently tight and thin. Treatment of a virtual non-producer is reported that

was close to being abandoned and has, after hydrafrac, been completed as a commercial producer. Estimated payout for treatment is 6 months. B. E. Eakin

H_2S Removal

Blohm, C. L., and Riesenfeld, F. C. (assigned to The Fluor Corporation Ltd.) AMINO-ETHER GAS TREATING PROCESS. U. S. 2,712,978 (1955) July 12.

In the amine process for purification of gases such as natural gas and refinery gas, the process is improved by use of hydroxy amino ethers as absorbent. Such compounds have the capacity for both acid gas absorption and moisture absorption. Advantages of reduction of the amine-to-gas ratio and amine circulation rate, reduction of amine losses, and reduced steam requirements are disclosed. D. M. Mason

Hoak, R. D. PROCESS FOR USING SULPHATE LIQUORS FOR RECOVERING VALUES FROM COKE OVEN GAS. U. S. 2,712,980 (1955) July 12.

Aqueous sulfuric acid—ferrous sulfate liquor ("pickle liquor") is recirculated at pH 6.2 to 7.0 in contact with raw, tar-free coke oven gas containing ammonia, hydrogen sulfide, hydrogen cyanide, thiocyanic acid and tar bases. The resulting slurry is steamed at pH 7.2 to 7.5 to remove tar bases, and is then oxidized at pH 6.5 to 7.5 to oxidize the iron sulfide to iron oxide and free sulfur. After filtration the clear liquor is crystallized to separate ammonium sulfate, acidified and heated to yield recoverable thiocyanic acid gas, while the solids are leached with alkali (lime) to recover ferrocyanides, and further froth-floated to remove sulfur and separate the iron oxide. The control of temperature (45° to 55° C.) and pH (6.5 to 7.5) of the oxidation step is especially claimed. O. P. Brysch

LP-Gas Storage

Kroeger, C. V. ECONOMICS AND ENGINEERING OF STORING LP-GAS IN SALT FORMATIONS. *Gas Age*, **116**, 15-18 (1955) July 28.

A summary treatment of LP storage in salt formations which gives comparative costs of various types of storage, and cost figures for several storage reservoirs. R. F. Bukacek

Reilly, J. L.P.G. STORAGE HITS NEW PEAK. *Oil Gas J.*, **54**, 60-63 (1955) August 1.

Cavern storage capacity for LP-gas is presently 15,900,000 bbls, up 73% in the last year. There are presently 173 storage projects in operation, and 30 more in the planning or construction stage. A table of the various projects including size, location, and material handled, is included. B. E. Eakin

Van Fossan, N. E. UNDERGROUND STORAGE ASSUMES STATURE. *Petroleum Refiner*, **34**, 193-97 (1955) May.

The first salt solution-cavity for storage was washed in 1949. A review of the developments in preparing solution cavities is presented, along with an outlook for the future. It is pointed out that one of the major needs of the LPG industry is development of a cheap storage system near the point of sales, and that salt cavities will only partly fill the bill. Research on new methods of sealing easily-mined formations should be undertaken. B. E. Eakin

UNDERGROUND GASOLINE STORAGE. *Petroleum Proc.*, **10**, 1150-51 (1955) August.

A Swedish developed system for storing gasoline or oil underground is briefly described. The most interesting feature of the method is its use of water as a sealing agent to seal against evaporation losses. R. F. Bukacek

Pipe Line Instruments

INSTRUMENTATION OF A NATURAL-GAS PIPELINE. *Instr. and Autom.*, **28**, 1312-15 (1955) August.

A report of the use of telemetering in gas trancmission by the Algonquin Gas Co. of New England. S. Hu

Pipe Line Problems

Chabre, G. HOW TO CONTROL FIRE DURING PIPE LINE TIE-INS. *Pipe Line Ind.*, **3**, 44-49 (1955) August.

A report of experience obtained by Southern California Gas Company in lowering a 200-foot section of 30-in pipeline under natural gas pressure where the rate of gas leakage at the open cut was controlled by means of a cracked valve. The escaping gas burned as the cutting or welding proceeded, the process thus being labeled a "fire control" method. R. F. Bukacek

Reed, P. HOW TOUGH CAN A PIPELINE JOB GET? *Oil Gas J.*, 54, 72-73 (1955) Aug. 29.
A description of the construction difficulties which TGT is encountering on their line running through White Plains, N.Y.
R. F. Bukacek

Reilly, J. THEY'RE 2 MONTHS AHEAD WITH 36-IN. *Oil Gas J.*, 54, 92-4 (1955) August 15.
A brief description of the techniques that have enabled the laying of 36″ pipe with conventional equipment and less difficulty than anticipated. R. F. Bukacek

Wilson, N. G. CHEMICALS CUT PIPELINE R. O. W. UPKEEP. *Oil Gas J.*, 54, 88-90 (1955) August 8.
Shell Pipe Line Corporation reports its results using various chemicals in control of weeds, brush, osage orange and mesquite and large woody plants on their pipeline right of way.
R. F. Bukacek

Pipe Line Testing

Greaves, M. S. HOW TO CALCULATE GAS LINE FLOW EFFICIENCIES. *Pipe Line Ind.*, 3, 30-33 (1955) August.

The method of efficiency testing and the calculation procedures used by Texas Eastern Transmission Corp. are discussed. The method is based on stabilizing the line for a period of 4 to 6 hours and using flow rates obtained from the measurements department and suitably adjusted. R. F. Bukacek

Poindexter, L. C., Proper, G., Orlofsky, S., Clark, O. W. A SYMPOSIUM ON GAS PIPE LINE TESTING. *Pipe Line Ind.*, 3, 20-28 (1955) August.
A summary of the comments made at the Texas A and I short course in gas technology by members of a panel discussion, on the relative merits of pipeline pressure testing with natural gas, air or water. R. F. Bukacek

Reservoir Behavior

Crawford, P. B., Bradford, R. I., England, A. C. and Ince, H. HOW TO DETERMINE STATIC BOTTOM-HOLE PRESSURE FROM SURFACE MEASUREMENTS. *Petroleum Eng.*, 27, B81-83 (1955) August.
A series of charts have been developed which permit the calculation of the bottom-hole pressure in gas wells from knowledge of the surface pressure and temperature, the depth, and the reservoir temperature. This simplifies the determination of reservoir pressure in dually completed wells where running instruments is a difficult problem. B. E. Eakin

River Crossings

Baird, R. C. WIND-INDUCED VIBRATION OF A PIPE-LINE SUSPENSION BRIDGE, AND ITS CURE. *Amer. Soc. Mech. Eng. Trans.*, 77, 797-804 (1955) August.

A report on the method developed by the Fluor Corporation to reduce the pipeline bridge vibration experienced by El Paso Natural Gas Co. R. F. Bukacek

Odom, L. M. ENGINEERING FOR PIPE LINE RIVER CROSSINGS. *Pipe Line News*, 27, 40-41, 45 (1955) August.

A discussion of the various problems involved in the crossing of rivers by pipelines, including sections on site selection, design considerations, installation procedure, and inspection and testing. R. F. Bukacek

Underground Storage

Boyd, F. A. UNDERGROUND GAS STORAGE IN THE APPALACHIAN AREA. *Petroleum Eng.*, 27, B84-97 (1955) August 27.

The storage of natural gas in underground reservoirs in the Appalachian area is reviewed. The reservoir discussed is the lens-type caused by permeability pinch-outs, so common to the Appalachian region. The author deals with the reasons for the popularity of underground storage together with plans for the location, acquisition, and development of storage fields for various uses. R. S. Walters

Ebdon, J. F. HERSCHER: FIRST USE OF WATER SAND FOR NATURAL GAS STORAGE. *Gas*, 31, 107-15 (1955) August.

A description of the Herscher Dome storage facility developed by Natural Gas Pipeline Co. of America and Texas Illinois Natural Gas Pipeline Co. The article summarizes the field geology, drilling program, operation and facilities. R. F. Bukacek

Fruechtenicht, H. L. UNDERGROUND GAS STORAGE. *Petroleum Eng.*, 27, D46-47 (1955) August 27.

Some of the highlight statistics on the growth of underground storage are taken from a report submitted at the Amer. Gas Assoc. Gas Supply, Transmission, and Storage Conference, Pittsburgh, Pennsylvania, May 9 to 19, 1955.

R. S. Walters

Unitized Recovery

Storment, D. H. HOW TO GET MAXIMUM RECOVERY FROM A DRY-GAS FIELD. *Oil Gas J.*, 54, 80-81 (1955) August 1.

The Wild Goose field in northern Sacramento Valley is an excellent example of how a gas field should be produced to obtain maximum ultimate recovery. By unitization of the field, gas can be removed solely through up-structure wells, encouraging an orderly water encroachment. The eleven pay zones are being produced from bottom upward, with withdrawal from each zone presently produced being fixed for each well. The gas contains about 20% nitrogen with a 790-815 Btu heating value.

B. E. Eakin

6. PETROLEUM; SYNTHETIC LIQUID FUELS

Fischer-Tropsch Synthesis

Anderson, H. C., Wiley, J. L. and Newell, A. BIBLIOGRAPHY OF THE FISCHER-TROPSCH SYNTHESIS AND RELATED PROCESSES: I REVIEW AND COMPILATION OF THE LITERATURE ON THE PRODUCTION OF SYNTHETIC LIQUID FUELS AND CHEMICALS BY THE HYDROGENATION OF CARBON MONOXIDE: II PATENTS. U. S. Bur. Mines Bull. 544; I, 1 to 532 + xvi, $2.25 (1954); II, 533 to 965, $1.75 (1955)

This comprehensive work comprises an alphabetic listing of abstracts of literature, including CIOS, BIOS and FIAT items, and patents pertaining to Fischer-Tropsch synthesis and carbon monoxide hydrogenation. Part I includes 3771 items and Part II has 4017 items, both with ample subject indexes; also a journal list and numerical patent list. O. P. Brysch

3-PHASE SYSTEM KEYS PROGRESS IN SYNTHETIC LIQUID FUELS. *Chem. Eng.*, 62, 120, 122 (1955) August.

Recent semi-commercial work on the Fischer-Tropsch reaction in a three-phase system with once-through conversions up to 97% has been reported by Rheinpreussen A.-G. The process uses an equimolar CO-H_2 synthesis gas and disperses it, together with a finely-divided iron catalyst in a liquid hydrocarbon medium. Yields of C_3-plus hydrocarbons are reported as high as 92-98% of total product yield. The Koppers Co. has a licensing agreement for the design of commercial plants in the Western Hemisphere and certain parts of Asia. Koppers feels that the process is not competitive in the U.S. but has potentialities elsewhere.

E. B. Shultz

Oil Recovery

Milner, C. P. and Power, H. H. SURFACTANT INFLUENCE ON FLOOD RECOVERY. *Petroleum Eng.*, 27, B114, 117-119 (1955) May.

An investigation is reported on the effect of reducing the surface tension of injected water on the recovery of oil in waterflooding operations. The experimental laboratory data indicates that addition of surface active agents may considerably improve oil recovery. Additional investigations are recommended to study the effect of other variables on recovery.

B. E. Eakin

Petroleum Coke

Weber, G. WITH MORE COKERS COMING REFINERS WILL HAVE COKE TO BURN. *Oil Gas J.*, 54, 62-62 (1955) August 8.

Refineries will be producing coke for "just fuel" as more new coking capacity goes into operation. Today 321,690 bbl capacity (10,000 tons) per day at 33 U. S. refineries is in operation, 2580 tons per day is under construction at seven plants and 1455 tons per day at 5 plants is in planning stages. In addition Canada is producing 430 tons and building 135 tons per day coke capacity. Of the 3,400,000 tons estimated production for 1955, 975,000 tons will go to aluminum, 1,100,000 to fuel, 750 to exports and 465 to graphite and chemicals. Charging of high-sulfur, heavy fractions will tend to downgrade much of this coke, so that more of it will appear in the utility fuel market and at variable prices. Charging of whole reduced crude, total

residuals, and blends of residuals to catalytic crackers, and also hydrogenation by the new HDS process, are under test and this present trend to coking may be offset at some future date. O. P. Brysch

Reforming Experience

Decker, W. H. and Stewart, D. FIRST SINCLAIR CATALYTIC REFORMER. *Petroleum Refiner*, 34, 131-36 (1955) August.

The operating experience from the Marcus Hook catalystic reforming unit, a 16,000 barrel-per day installation, using a platinum catalyst is presented. To illustrate the comparison of the first and second cycle operations, operating conditions, feedstock inspections, and yield data for these two periods are presented. The yields have been adjusted to the same octane. A review of these stipulations will indicate that after making allowance for differences it is evident that the regeneration operation was successful with no apparent deleterious effects to the catalyst. The activity level is the same or slightly improved. H. A. Dirksen

Synthesis Catalysts

Teichmann, C. F., and Grahame, J. H. (assigned to Texaco Development Corp.) HYDROCARBON SYNTHESIS WITH CATALYST OF LESS THAN ONE MICRON. U. S. 2,714,116 (1955) July 26.

The present invention relates to the synthesis of hydrocarbons and more particularly, to the catalytic production of hydrocarbons by the direct conversion of a mixture of synthesis gas comprising hydrogen and carbon monoxide in the presence of an active synthesis catalyst in fine particle form. A major advantage of the present invention is the reduced overall consumption of catalyst in a continuous operating process. For example, a typical fluid hydrocarbon synthesis process using a fluidized, solid particle, iron catalyst and charging about 240 million cubic feet of synthesis gas a day, will consume about 6 tons of makeup catalyst per operating day. This means a current consumption of about one pound catalyst per 20,000 cubic feet of charge gas under settled operation, neglecting the substantial catalyst losses, due to discharging the contents of the reactor at the termination of an operating run. The present invention, however, in addition to obviating the problem of catalyst fluidization, enables conversion of an equivalent amount of reactants by means of a substantially decreased amount of catalyst in the form of smoke particles. For example, with a smoke type catalyst, in accordance with the present invention, the catalyst consumption does not amount to more than one pound per 30,000 cubic feet of charge gas, and may be substantially less. Therefore, there is a substantial saving in catalyst requirement, due presumably, to the surprisingly high activity of the minute smoke particles and the effective contact which occurs resulting from their wide dispersion throughout the reactant gas mixture. The smoke phase of fine, essentially dust-like particles is not appreciably affected by operating conditions or by physical changes in the catalyst, and involves no problem of catalyst regeneration or handling. Selected Extracts

7. ANALYTICAL METHODS AND TESTS

Air Contaminants

Silverman, L. SAMPLING AND ANALYZING AIR FOR CONTAMINANTS. *Air Cond., Heating and Ventilating*, 52, 88-100 (1955) August.

The intensity and frequency of analyzing air in work places has progressively increased in recent years. The wide-spread introduction of new and different chemicals has created a need for new and different sampling and analytical methods. A discussion is presented of air contaminants in work places, their influence on sampling and analytical methods to be employed, and sampling procedures. Sampling devices are described for gases and vapors as well as particulate matter. Author's Abstract

Calorimetry

Barker, J. E., Mott, R. A. and Thomas, W. C. STUDIES IN BOMB CALORIMETRY III—DETERMINATION OF THE HEAT CAPACITY (WATER EQUIVALENT) OF A BOMB CALORIMETER SYSTEM. *Fuel* (British), 34, 283-302 (1955) July.

It is shown that the term 'effective heat capacity' is preferable to 'water equivalent'. The effective heat capacity is shown to vary, not only with the temperature of the water, but also with that of the metallic parts of the calorimeter, a simple formula being given which enables the two opposing effects to be summed

and determined values referred to a standard temperature. The variation of the calorific value of benzoic acid with the final temperature of the determination, the amount of water in the bomb and other factors is described. Various steps to improve the repeatability of the determination are discussed, perhaps the most important of which is to bring the final calorimeter temperature within ±0.5° C. of the jacket temperature. Authors' Abstract

Barker, J. E., Mott, R. A. and Thomas, W. C. STUDIES IN BOMB CALORIMETRY IV—CORRECTIONS. *Fuel* (British), **34**, 303-16 (1955) July.

The basis on which cooling corrections are calculated is described and the merits of different formulae considered. The sulphur, nitrogen and ignition corrections are discussed, it is being shown that the nitrogen correction can be taken as a constant for most solid and liquid fuels—other than coke and anthracite—and, with the ignition correction, treated as a source of constant heat change and usually ignored. Methods of correcting for the effects of chlorine, sulphation of ash, ejection of ash and corrosion of the bomb are described. Thermometry is shown to be a more serious source of error than is usually appreciated; means of reducing and overcoming this error are discussed.
Authors' Abstract

COS Determination

Snyder, R. E., and Clark, R. O. DETERMINATION OF TRACE AMOUNTS OF CARBONYL SULFIDE IN GASEOUS HYDROCARBONS. *Anal. Chem.*, **27**, 1167-71 (1955) July.

A simple method for determination of trace amounts of carbonyl sulfide in hydrocarbon gases is based on the reaction with piperidine in alcoholic solution to form piperidine oxythiocarbamate, which is determined spectrophotometrically. The method is applicable to gases containing hydrogen sulfide, sulfur dioxide, and aromatic hydrocarbons not exceeding the equivalent of 50 p.p.m. of benzene; higher concentrations of aromatics can be tolerated, provided they are known or can be determined. The results on synthetic blends are within the range of 2 to 75 p.p.m. of carbonyl sulfide and are reliable to within 5% of the amount present. A procedure is described for preparing carbonyl sulfide having a purity approaching 99.9%. The sulfide can be stored at 0° C. for several months in a stainless steel bomb without decomposition, provided its initial assay is better than 99.5%.
Authors' Abstract

CO_2 Method

Blom, L. and Edelhausen, L. DIRECT TITRATION OF CARBON DIOXIDE. *Anal. Chim. Acta*, **13**, 120-28 (1955) August.

Determination of CO_2 in gases is effected by absorption in pyridine or acetone followed by direct titration with sodium methylate in an organic solvent. Application of the method to determination of CO_2 in air, and to micro and semi-micro elementary determination of carbon and oxygen is described. D. M. Mason

Gas Sampling

Hawley, E. R. and Solomon, E. SAMPLER FOR GASES AT HIGH PRESSURE. *Chem. Eng.*, **62**, 202, 204, 206, 208, 210 (1955) August.

A device is shown which withdraws a gas sample at operating pressure by positive displacement of mercury. The sample is taken at a measured and controlled rate to insure its being representative of the total stream during a test period. E. B. Shultz

Gas Separation

Hancher, C. W., and Kammermeyer, K. SEMI-AUTOMATIC GAS SEPARATION EQUIPMENT. *Anal. Chem.*, **27**, 83-87 (1955) January.

A simultaneous-sampling, double automatic gas buret has been developed for gas separations through microporous membranes, whereby one operator obtains a greater degree of accuracy by use of automatic timing and pressure controls. Experimental data agrees well with data from manually operated apparatus and less time is required per determination.
D. J. Dennison

H_2S Method

Hart, J. S. THE ACCURATE MEASUREMENT OF HYDROGEN SULPHIDE IN TOWN GAS. *Chem. and Ind.* (British) No. 37, 1148-49 (1955)

H_2S is determined by passing a measured quantity of gas through lead acetate paper and measuring the resulting stain on a photoelectric instrument. D. M. Mason

Metals in Oils

Barney, J. E. II. DETERMINING TRACE METALS IN PETROLEUM DISTILLATES. AN ACID-EXTRACTION TECHNIQUE. Barney, J. E. II, and Haight, G. P., Jr. EFFICIENCY OF RECOVERY METHODS. *Anal. Chem.*, 27, 1283-86 (1955) August.

Several methods of extracting and concentrating metals and metallo-organic trace contaminates in petroleum fractions are discussed. The coefficient of variation of the method is 11%. About 6 man-hours and 72 hours of elapsed time are required per analysis. R. R. Amrine

Solid Fuel Standards

King, J. G. INTERNATIONAL METHODS OF ANALYSIS OF SOLID FUELS. *Coke and Gas* (British), 17, 305-11 (1955) August.

A review is presented of the proceedings at the fourth (June 6-10) meeting of Technical Committee 27 on Solid Mineral Fuels, of the International Organisation for Standardization, at Stockholm, Sweden. Of the 18 members, 14 countries sent 53 representatives. Progress on solid fuel analysis since 1953 is indicated by the preparation of 17 draft recommendations and of a further 12 draft proposals. Of these methods, 7 of each category are under active advancement. Details of these methods, which were investigated by working groups, are discussed and the author concludes that some 25 methods on 13 subjects have a chance of acceptance as standards this year or next.

O. P. Brysch

8. GENERAL AND PHYSICAL CHEMISTRY

Applied Radiation

Wright, J. POTENTIAL USES OF FISSION PRODUCTS IN THE CHEMICAL INDUSTRY. *Chem. and Ind.* (British), No. 33, 1026-31 (1955) August 13.

A discussion of the available type of fission products and their types of radiation is presented. Several potential uses for this material in the chemical industry are described.

D. V. Kniebes

CO_2 Properties

Price, D. THERMODYNAMIC FUNCTIONS OF CARBON DIOXIDE. ENTHALPY, ENTROPY, AND ISOBARIC HEAT CAPACITY AT 100° TO 1000° C. AND 50 TO 1400 BARS. *Ind. Eng. Chem.*, 47, 1649-52 (1955) August.

A report of work done at the Naval Ordnance Laboratory in calculating various thermo-dynamic functions for CO_2. The methods used and tabulations of various properties are given.

R. F. Bukacek

Detonations

Heybey, W. H. and Reed, S. G., Jr. WEAK DETONATIONS AND CONDENSATION SHOCKS. *J. Appl. Physics*, 26, 969-74 (1955) August.

Weak detonations initiated by rapid condensation are shown to be different from chemical detonations which are initiated by shocks. Partial condensation of water vapor in a steady supersonic air stream and rapid condensation of steam in steady nozzle flow are discussed as typical examples of weak condensation detonation.

S. Hu

Differential Thermal Analysis

Honeyborne, D. B. DIFFERENTIAL THERMAL ANALYSIS AND ITS APPLICATION TO THE STUDY OF BUILDING MATERIALS. *Chem. and Ind.* (British), No. 24, 662-69 (1955) June 11.

The principles of differential thermal analysis and its applications in the study of clays, cement and other building materials are discussed. Although D. T. A. is a comparative rather than absolute method in mineral analysis, it provides a rapid mineralogical reconnaissance, more readily than the time-consuming chemical, petrological and X-ray diffraction analyses.

K. C. Channabasappa

Methane Vapor Pressure

Armstrong, G. T., Brickwedde, F. G., and Scott, R. B. VAPOR PRESSURES OF THE METHANES. *J. Res. Nat. Bur. Standards*, 55, 39-52 (1955) July.

This article reports the experimental investigation of the effect on the physical properties of replacing the hydrogen atoms in the methane molecule with heavy hydrogen (deuterium). The triple points and the vapor pressure versus temperature behavior (of each of the deuteromethanes were determined). The ratios of the vapor pressures of the methanes are expressed

by equations of the form T $\log_{10} P_o/PH = A-B/T$. The constants are given for each of the deutermoethanes for the solid, and the liquid phases. B. E. Eakin

Specific Heats

Worthington, A. E., Marx, P. C., and Dole, M. CALORIMETRY OF HIGH POLYMERS. III. A NEW TYPE OF ADIABATIC JACKET AND CALORIMETER. *Rev. Sci. Instr.*, **26**, 698-702 (1955) July.

This paper describes a new type of adiabatic jacket and a modified calorimeter designed especially for the measurement of the specific heats of high polymers in the range −20 to +300° C. Authors' Abstract

9. ORGANIC CHEMISTRY

Acetylene Production

Bills, J. L. (assigned to Union Oil Co.) PRODUCTION OF ACETYLENE. U. S. 2,713,601 (1955) July 19.

A partial combustion process for the production of acetylene is described wherein yields equivalent to or higher than obtained when using oxygen are claimed while employing air as the oxidizing medium. The improved results are attributed to the addition of a highly preheated stream of hydrogen to the air-hydrocarbon mixture. J. M. Reid

Box, E. O., J. (assigned to Phillips Petroleum Co.) TREATMENT OF HYDROCARBON GASES CONTAINING ACETYLENE. U. S. 2,712,559 (1955) July 5.

A process is described for conversion of very low concentrations of acetylene in gaseous mixtures to acetaldehyde. The reaction is catalytic, employing zinc zirconate, hydrating the acetylene with steam at atmospheric to 400 psig pressure, 250 to 400° C. and space velocities of 100 to 400°. Where olefins are present, such as ethylene, very little loss of these materials is claimed. J. M. Reid

Farnsworth, J. F., Manes, M., McGurl, G. V. and Bretz, G. M. ETHYLENE AND ACETYLENE PRODUCTION. *Ind. Eng. Chem.*, **47**, 1519-22 (1955) August.

The conversion of natural gas, ethane and propane to acetylene in a cyclic-regenerative cracking furnace is described. H. R. Linden

Milligan, T. J. (assigned to E. I. du Pont de Nemours and Co.) PURIFICATION OF ACETYLENES. U. S. 2,714,940 (1955) August 9.

A purification process is described for the separation of acetylene from low concentration gas mixtures obtained from the pyrolysis of hydrocarbons. A single solvent, dimethylformamide, is employed in the process. J. M. Reid

Sachsse, H., Kosbahn, T., and Lehrer, E. (assigned to Badische Anilin- und Soda-Fabrik A.-G.) PROCESS FOR THE PRODUCTION OF ACETYLENE BY INCOMPLETE COMBUSTION OF HYDROCARBONS. U. S. 2,715,648 (1955) August 16.

An improvement in the partial combustion process for acetylene production is claimed wherein the distributing block (burner) is made up of fewer passages of larger diameter than present practice (10 to 35 mm.) and including a means for causing a spiral flow of the gas through the passages. The average life of the block is thereby increased from about 6 weeks to 4 months. J. M. Reid

CS_2 Production

Guebert, K. W. (assigned to The Dow Chemical Co.) CARBON BISULFIDE PRODUCTION. U. S. 2,712,982 (1955) July 12.

A novel catalyst for the reaction of sulfur with a paraffin hydrocarbon to produce carbon disulfide is magnesium oxide promoted by at least one oxide of nickel, cobalt, or molybdenum. D. M. Mason

10. CHEMICAL ENGINEERING

Catalyst Handling

Kollgaard, R. (assigned to Houdry Process Corp.) METHOD AND APPARATUS FOR ELEVATING GRANULAR MATERIAL. U. S. 2,715,048 (1955) August 9.

A method is described for lifting granular catalytic material through a pipe by means of a gaseous medium as commonly employed in hydrocarbon conversion. Turbulence and impingement of the catalytic material is minimized according to this system with a consequent lowering of attrition losses. E. J. Pyrcioch

Cooling Towers

Kennedy, G. F., and Margen, P. H. ECONOMIC DESIGN AND SELECTION OF COOLING TOWERS.—I. *Combustion*, 27, 34-38 (1955) August.

It is shown that representation of the performance of a cooling tower by a single coefficient greatly simplifies the designer's task. This coefficient can be used to determine the economic compromise between the friction loss and heat transfer properties of the packing.

R. T. Ellington

Fractionation

Acrivos, A. and Amundson, N. R. ON THE STEADY STATE FRACTIONATION OF MULTI-COMPONENT AND COMPLEX MIXTURES IN AN IDEAL CASCADE. Part IV. THE CALCULATION OF THE MINIMUM REFLUX RATIO. *Chem. Eng. Science*, 4, 159-66 (1955) August.

Equations for calculating the minimum reflux ratio in the rectification of complex mixtures are developed. Two illustrative examples are given, one for continuous and one for semi-continuous mixtures. S. Hu

Amundson, N. R. ON THE STEADY STATE FRACTIONATION OF MULTICOMPONENT AND COMPLEX MIXTURES IN AN IDEAL CASCADE. PART III. DISCUSSION OF THE NUMERICAL METHOD OF CALCULATION. *Chem. Eng. Science*, 4, 141-148 (1955) June.

In this paper the formulae necessary for rectification calculations on complex mixtures are summarized and developed for numerical computation. These formulae involve the computation of improper integrals for which a method of calculation is developed. A numerical example is considered in some detail since these calculations are not of a routine nature. The calculations were carried out in the I.B.M. 602 A. Calculating Punch. The plate by plate method is also considered. Author's Abstract

Fundamental Quantities

Klingenberg, A. DIMENSIONAL SYSTEMS AND SYSTEMS OF UNITS IN PHYSICS WITH SPECIAL REFERENCE TO CHEMICAL ENGINEERING. PART II. PRACTICAL RULES FOR AUTHORS AND READERS AND THE NEED FOR THEIR OBSERVANCE. *Chem. Eng. Science*, 4, 167-77 (1955) August.

For the purpose of avoiding unnecessary mistakes and confusion in the choice and use of systems of units, a number of practical rules have been formulated. The important idea is that the fundamental quantities chosen should be in consistent units and convenient to use and should include all the variables involved in the physical system concerned. Examples from the literature are given as illustrations. S. Hu

Liquid Atomization

Troesch, H. A. THE ATOMIZATION OF LIQUIDS. *Engineers' Digest*, (British) 16, 367-70 (1955) August.

A theoretical treatment of maximum droplet size in the atomization process is presented. An expression is developed with which maximum droplet size can be calculated from the physical constants for the fluids involved and the fluid velocity at the beginning of droplet formation. Results from this expression are shown to be in much closer agreement with experimental data than previous formulae.

J. M. Reid

Pressure Feeder

Edwards, T. (assigned to Incandescent Heat Co., Ltd.) MECHANISM FOR FEEDING GRANULAR OR POWDERED MATERIAL FROM A RELATIVELY LOW PRESSURE TO A HIGHER PRESSURE. U. S. 2,712,963 (1955) July 12.

This motor-driven feeder for feeding pulverized material against pressure employs a rotating carrier plate with pockets for transfering the material from atmospheric pressure at the feeding point to the high pressure discharge point where it is picked up by a high pressure gaseous blast. A spring-loaded sealing mechanism is provided at the high pressure point.

E. J. Pyrcioch

Two-Phase Flow

White, P. D. and Huntington, R. L. HORIZONTAL CO-CURRENT TWO-PHASE FLOW OF FLUIDS IN PIPE LINES. *Petroleum Eng.*, 27, D40-45 (1955) August.

A tentative flow pattern chart is presented for

type of flow (stratified, or slug) that would exist under given sets of mass flow rates of liquid and vapor. An empirical correlation is presented, which represents atmospheric data more accurately than those previously presented. R. T. Ellington

11. PROCESS EQUIPMENT AND INSTRUMENTATION

Computor Techniques

Booth, A. D. SOME CURIOSITIES OF BINARY ARITHMETIC USEFUL IN TESTING BINARY COMPUTERS. *Computers and Automation*, 4, 33, 42 (1955) August.

The reciprocal of any number N which can be expressed in the form $(2^p \pm 1)$ has a repetitious binary pattern. Similarly, the square of any binary number that can be expressed in the form $(1\text{-}2^{-p})$ is of a repetitious pattern. These useful forms may be used to check the functions of computers working in the binary scale.

S. Hu

Deutsch, M. L. and Hicks, J. S. SIMULATION OF A REFINERY BY A DIGITAL COMPUTER. *World Petroleum*, 26, 69-71 (1955) July 15.

Questions as to product yield and distribution under specified operating conditions, crude oil inputs, and refinery throughput rates are answered rapidly by use of electronic digital computers. Socony Mobil Oil Co., Inc., has installed an Electro Data computer specifically for this type of calculation. The programs presently developed permit calculation of operating conditions to meet a specified product output, or calculation of output from specified crude inputs and operating conditions, providing a flexible control basis. B. E. Eakin

Gas Density

Goff, J. C. (assigned to the United States of America) APPARATUS FOR MEASURING THE DENSITY OF GASES. U. S. 2,713,788 (1955) July 26.

The fluid is passed through a whistle or nozzle, producing an audible signal of variable pitch which is amplified, filtered and entered into a heterodyne circuit. The output of the electronic device is employed to actuate a tape recorder, or some other means of continuously recording fluid density as a function of a constant frequency signal. E. B. Shultz

12. MATERIALS OF CONSTRUCTION

Cathodic Protection

Noser, W. P. PLACING GROUND CONTACT ANODES WITH A HIGH VELOCITY WATER JET. *Corrosion*, 11, 248t (1955) June.
The installation of duriron anodes by use of water jets is described, values of current drained, anode to pipe resistance, and soil resistivity are tabulated. G. G. Wilson

Schwalm, L. AN AUTOMATIC CIRCUIT INTERRUPTER FOR USE IN CATHODIC PROTECTION SYSTEM DESIGN. *Corrosion*, 11, 254t (1955) June.
The circuit diagram and parts list for a D. C. operated circuit interrupter is presented.
G. G. Wilson

Senatoroff, N. K., and Schilling, W. M. CATHODIC PROTECTION ON THE BIGGEST INCH LINE. *Pipe Line News*, 27, 55-56, 58, 60-62 (1955) July; 50, 52, 54-60 (1955) August.

A description of the measures taken by Southern Counties Gas Co. to protect their 30-inch pipeline against corrosion. The paper reviews the selection of methods used and the steps in designing a cathodic protection system to supplement the external coating. Part II describes the early installation and effective protection of 4 cathodic stations in 1948-49, as well as the 4 additional stations needed on the 212-mile main line by 1953, and 3 more on the 176-mile loop-line. Special problems introduced by the Colorado River bridge, cost analysis of protection, periodic potential surveys, and coupon corrosion tests are discussed briefly and illustrated with data and charts.

R. F. Bukacek

Coatings

Bailey, R. W. ZINC COATINGS ON STEEL. *Ind. Finishing*, 8, 401-09 (1955) July.
The processes of hot-dip coating, electro-deposition and spray coating are described in detail and the respective merits of the coatings discussed. R. T. Ellington

Curtis, A. C. (assigned to Pipelife, Inc.) APPARATUS FOR COATING THE INTERIOR OF WELL PIPES. U. S. 2,713,908 (1955) July 26.

An apparatus is claimed for cleaning and coating the interior of oil and gas well pipes in place. G. G. Wilson

Flournoy, R. W. PRELIMINARY EVALUATION OF PROTECTIVE COATING SYSTEMS. *Corrosion*, 11, 289-90t (1955) July.

The equipment and procedures used for the preliminary evaluation of coating materials are described. G. G. Wilson

Matheny, F. M. (assigned to Pipe Linings, Inc.) PIPE LINING DRAG DEVICE. U. S. 2,711,000 (1955) June 21.

A device for evenly spreading a cement lining over the interior surface of pipe when pulled through the pipe in place behind a slug of cement. Greater uniformity of thickness of the coating is claimed by use of this device assigned to Pipe Linings, Inc. G. G. Wilson

Melbourn, J. PROTECTIVE LININGS FOR CORROSIVE MATERIALS. *Can. Chem. Processing*, 39, 34, 36 (1955) July.

Several chemically resistant coatings for steel containers are described, including some of the surface preparation requirements on application. R. F. Bukacek

Corrosion

Farrar, G. L. STOP THAT COSTLY CORROSION IN REFINING EQUIPMENT. *Oil Gas J.*, 54, 120, 123 (1955) June 6.

A resumé of information on refinery corrosion compiled from technical papers, informal discussions, and symposiums presented at the March, 1955 meeting of National Association of Corrosion Engineers. Information on the use of air injection to halt hydrogen blistering, and of the organic inhibitor *Nalco* 161, to control corrosion in a refinery processing sour crude oil is presented. G. G. Wilson

Powell, S. T. and von Lossberg, L. G. OF WHAT USE ARE CHEMICAL TREATMENTS IN CONTROLLING CORROSION? *Mech. Eng.*, 77, 495-98 (1955) June.

An evaluation of products now being offered widely for the solution of numerous corrosion problems in steam-generating equipment.

Authors' Abstract

Plastic Pipes

Holtz, R. T. PLASTIC PIPE LINKS CRUDE GATHERING SYSTEM. *Oil Gas J.*, 54, 112-13 (1955) June 27.

The use of rigid polyvinyl chloride plastic pipe to handle crude oil in a water-flood system is described. All fittings were plastic except for brass shutoff valves and the operating pressures were 40 to 60 psi. G. G. Wilson

Seymour, R. B. PLASTIC PIPE FOR UNDERGROUND STRUCTURES. *Corrosion*, 11, 322-327t (1955) July.

Tabulated data on the physical properties and chemical resistances of pipe made from epoxy-glass, polyester-glass, cellulose acetate-butyrate, polyethylene, styrene-rubber, and polyvinyl chloride are presented. Tabulated specifications for several types of plastic pipe are also included. Important design considerations are briefly summarized. G. G. Wilson

Refractories

Peel, G. N. THE CERAMIC APPLICATIONS OF ZIRCON AND ZIRCONIA. PART II. *Ceramics*, (British) 7, 163-8 (June); 207-14 (1955) July.

The article includes a discussion on the refractory applications of zircon (a silicate) and zirconia (an oxide). The stabilized form of zirconia must be used, as the pure oxide undergoes a crystalline inversion when heated to temperature above 800° C. At high temperatures both zircon and zirconia act as acid refractories. Compositions and physical properties are given for zircon and zirconia. E. J. Pyrcioch

Water Treatment

Drane, C. W. WATER TREATMENT. *Gas Times*, (British) 84, 81-82, 84, 89-90 (1955) July 22; *Gas J.* (British) 283, 317, 318, 320 (1955) August 3.

Water difficulties encountered in steam boilers used in the gas production industry are described and treating methods are discussed. Discussion is concerned primarily with hardness and corrosion problems. G. G. Wilson

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Institute of Fuel (British). Journal
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